
ENVIRONMENTAL Fact Sheet



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ARD-EHP-6

2004

Mixed Xylenes (meta-, ortho-, para-): Health Information Summary

Xylenes are clear, flammable liquids with a sweet odor that are found in paints, inks, adhesives and pesticides. Xylenes may also be used as a cleaner/degreaser of metals. Industries that use xylenes include the printing, rubber, leather, chemical, plastics, and synthetic fibers businesses. Xylenes occur naturally as a component of petroleum and are produced indirectly during gasoline refining. There are three chemical forms (isomers) of xylenes: meta, ortho, and para, which occur simultaneously in a mixture. The lowest odor threshold for one of the isomers in water is reported as 0.53 parts per million (ppm); the lowest odor threshold in air is reported as 0.08 ppm.

Exposures to the general population are most often from ambient air because of automotive exhaust, filling gasoline tanks, and using xylene-containing consumer products. Because of xylenes use in building and consumer products, indoor air concentrations may often be higher than outdoor air concentrations.

Health Effects

Absorption/Metabolism

Approximately 60 percent of xylenes present in air are absorbed after inhalation; absorption after oral exposure is approximately 90 percent. Xylenes will be absorbed through the skin but to a much lesser extent than the other exposure routes. Studies indicate that most of the xylenes absorbed by the body are eliminated within 24 hours after exposure.

Short-Term (Acute) Effects

Inhalation exposure to high xylene concentrations have been associated with nose and throat irritation, labored breathing, and impaired lung function in humans. Similar symptoms have been observed in animal studies.

Inhalation exposure to xylenes may produce central nervous system disturbances such as changes in short-term memory and impaired reaction times. Symptoms observed in occupational studies include headache, dizziness, difficulty concentrating, and impaired memory. Nervous system effects observed in animal studies across several species were incoordination, tremors, muscle spasms, labored breathing, behavioral changes, and hearing loss.

Long-Term (Chronic) Effects

Workers exposed to 21 ppm of xylenes for an average of seven years reported an increase in such symptoms as increased anxiety, forgetfulness, reduced ability to concentrate, and dizziness.

Rats exposed to 1,100 ppm xylenes by inhalation for one year had increased liver weights and some other very minor effects considered as adaptive (in response to exposure, but not harmful). Rats exposed orally to 500 milligrams per kilogram of bodyweight (mg/kg/day) for approximately two years had increased liver and kidney weights, considered to be adaptive responses, but no adverse changes to these organs were noted upon examination.

Reproductive/Developmental Effects

There is some evidence from animal studies that exposure to high xylene concentrations reduced the number of live offspring, decreased fetal body weight, caused skeletal variations, and delayed skeletal development.

Carcinogenicity (Ability to Cause Cancer)

The National Toxicology Program (NTP) completed a two year carcinogenicity study of mixed xylenes. Results were negative for rats and mice exposed orally to high concentrations. The NTP concluded that there is no evidence of carcinogenicity. However, because of some problems with the study, the strength of the results was compromised. The Environmental Protection Agency (EPA) has categorized xylenes as a Group D carcinogen (inadequate evidence to classify).

Health Standards and Criteria

The U.S. EPA has established a Maximum Contaminant Level Goal (MCLG) for xylenes in public drinking water systems. MCLGs are non enforceable health standards for drinking water. MCLGs are set at a level at which no adverse health effects would be expected to result from the consumption of two liters (0.53 gallons) of contaminated water per day by a 70 kg (154 lb) adult. The established MCLG for xylenes is 10 ppm (ppm = milligrams per liter or mg/l).

The EPA has also established a Maximum Contaminant Level (MCL) for xylenes in public drinking water systems. MCLs are enforceable drinking water standards determined by balancing the adverse health effects of a particular chemical against the feasibility and cost of treating contaminated water. The MCL for xylenes is also 10 ppm.

The Occupational Safety and Health (OSHA) permissible exposure limit (PEL) for workplace air is 100 ppm averaged over an eight-hour day.

For more information, please contact the DES Environmental Health Program, 29 Hazen Drive, Concord, NH 03302-0095; (603) 271-4608.

Suggested Reading and References

Casarett and Doull's Toxicology: The Basic Science of Poisons, Fifth Edition. Klaassen, C.D., ed. McGraw-Hill Publishing Co., Inc., New York, 1995.

Toxicological information on xylenes. Integrated Risk Information System (IRIS). U.S. EPA, Office of Health and Environmental Assessment. Last revision 2/03.

Toxicological Profile for Xylenes (Update). Agency for Toxic Substances and Disease Registry (ATSDR). Atlanta, GA. August, 1995.